

to what M. Hermite has called the "four types" of binary quintics.

Other covariants of the cubic are discussed, and in particular a general expression is given for that covariant of the 9th order which geometrically represents a surface passing through the twenty-seven right lines on the surface of the third order represented by the cubic.

III. "On the Construction of a new Calorimeter for determining the Radiating Powers of Surfaces, and its application to the Surfaces of various Mineral Substances." By W. HOPKINS, Esq., M.A., F.R.S., &c. Received June 1, 1860.

(Abstract.)

When the author's Memoir on the Conductivity of various substances was presented to the Society, it was intimated to him on the part of the Council of the Society, that it might be advisable to determine absolute instead of relative conductivities, the latter only having been attempted in his previous experiments. It is partly in consequence of this intimation, and partly from the desire to make his former investigations more complete, that the author has given his attention to the construction of a calorimeter which might serve for this purpose. His present memoir contains a description of this instrument, with the results obtained from its application to the surfaces of various substances.

The apparatus used by Messrs. Dulong and Petit was more delicate and complete than the simpler instrument devised by the author of this paper, but it was calculated only to determine the radiating powers of substances of which the bulb of a thermometer could be constructed, or with which it could be delicately coated. The only substances to which, in fact, it was applied, were glass and silver, the radiation taking place, in the first case, from the naked bulb of the thermometer, and, in the second, from the same bulb coated with silver paper. In these cases, too, it was the whole heat radiating in a given time from the instrument, and not that which radiated from a given area, that was determined. For this latter purpose the apparatus was not well calculated, on account of the difficulty of obtaining with accuracy the area of the surface from which radiation took place. The instrument here described can be easily applied to

any plane radiating surface, while the area of that surface can be easily determined to any required degree of accuracy. The quantity of heat radiating under given conditions, from a unit of surface in a unit of time, can thus be easily ascertained. The paper contains a detailed description of the instrument, and of the experiments made with it.

The following are experimental results thus obtained,—the unit of heat being that quantity of heat which would raise 1000 grs. of distilled water 1° Centigrade. The formula is that of Dulong and Petit, where

θ = temperature of the surrounding medium (the air in these experiments), expressed in Centigrade degrees ;

t = the excess of the temperature of the radiating surface above that of the surrounding medium, in Centigrade degrees ;

p = pressure of the surrounding medium (the atmosphere in these experiments), expressed by the height of the barometer in metres ;

$a = 1.0077$, a numerical quantity which is always the same for all radiating surfaces and surrounding media.

Then if Q denote the quantity of heat, expressed numerically, which radiates from a unit of surface (a square foot) in a unit of time (one minute), we have the following results for the substances specified :—

Glass.

$$Q = 9.566 a^{\theta}(a^t - 1) + .03720 \left(\frac{p}{.72} \right)^{.45} t^{1.233}$$

Dry Chalk.

$$Q = 8.613 a^{\theta}(a^t - 1) + .03720 \left(\frac{p}{.72} \right)^{.45} t^{1.233}$$

Dry New Red Sandstone.

$$Q = 8.377 a^{\theta}(a^t - 1) + .03720 \left(\frac{p}{.72} \right)^{.45} t^{1.233}$$

Sandstone (building stone).

$$Q = 8.882 a^{\theta}(a^t - 1) + .03720 \left(\frac{p}{.72} \right)^{.45} t^{1.233}$$

Polished Limestone.

$$Q = 9.106 a^{\theta}(a^t - 1) + .03720 \left(\frac{p}{.72} \right)^{.45} t^{1.233}$$

Unpolished Limestone (same block as the last).

$$Q = 12.808 a^{\theta}(a^t - 1) + .03720 \left(\frac{p}{.72} \right)^{.45} t^{1.233}$$